CLAIMS

1. Catalytic secondary reforming process, for the production of synthesis gas, of the type comprising the successive steps of:

- feeding a first gas flow comprising hydrocarbons and a second gas flow comprising oxygen into a reforming reactor, at least one of said gas flows being fed into said reactor in a predetermined feed direction substantially parallel, preferably coaxial, to a longitudinal axis of said reactor,

- mixing said gas flows in said reactor, with substantially simultaneous oxidation of the hydrocarbons of said first gas flow by the oxygen of said second gas flow,

characterized in that said step of mixing said gas flows takes place by giving to said at least one of said gas flows a rotating swirling motion about said predetermined feed direction

2. Catalytic secondary reforming process according to claim 1, characterized in that said at least one of said gas flows corresponds to said second gas flow comprising oxygen.

3. Catalytic secondary reforming process according to claim 1, characterized in that said first gas flow comprising hydrocarbons and said second gas flow comprising oxygen are fed into said reactor in said predetermined feed direction, keeping them separate for an initial portion of said reactor of predetermined length, said flows being one inside the other and coaxial, and in that said mixing step takes place downstream of said portion, giving to at least

one of said inner and coaxial flows a rotating swirling motion around said predetermined feed direction.

4. Catalytic secondary reforming process according to claim 3, characterized in that said second gas flow comprising oxygen is inside and coaxial to said first gas flow comprising hydrocarbons.

5. Catalytic secondary reforming process according to claim 4, characterized in that a rotary swirling motion is given to said first gas flow comprising hydrocarbons, said rotary swirling motion of said first flow being in an opposite direction with respect to said rotary motion of said second flow.

6. Catalytic secondary reforming process according to claim 3, characterized in that said mixing step takes place by giving both gas flows rotary swirling motion about said predetermined feed direction, the rotary swirling direction of said first flow being in an opposite direction with respect to the rotary motion of said second flow.

7. Reactor for carrying out a reforming process according to claim 1, comprising a substantially cylindrical shell (2), with a substantially vertical axis (A-A), a first zone (Z1) and a second zone (Z2), representatively divided by a plane (B) perpendicular to said axis (A-A) and in fluid communication with each other, a catalytic bed (3) housed in said second zone, a reaction chamber (5) in said first zone (Z1), a first duct (8) in fluid communication with said reaction chamber (5), a second cylindrical duct (7) having said axis (A-A) substantially vertical, in fluid communication with said reaction chamber (5), characterized in that said second duct (7) comprises internally a

swirling device (12) to give swirling motion to a fluid which crosses it.

8. Reactor according to claim 7, characterized in that said first duct (8) is cylindrical and in that said second duct (7) is coaxial, concentric and arranged inside said first duct (8).

9. Reactor according to claim 7, characterized in that said second cylindrical duct (7) extends inside said reaction chamber (5).

10. Reactor according to claim 7, characterized in that said second cylindrical duct (7) comprises an open end (18) diverging towards the walls of said reaction chamber (5).

11. Reactor according to claim 10, characterized in that said open end (18) comprises a frusto-conical shaped section (13), coaxial with said second cylindrical duct (7) and having taper facing towards the center of the duct, with opening angle at a predetermined size, greater than or equal to 30° and less than or equal to 180°.

12. Reactor according to claim 11, characterized in that said open end (18) is joined to said second duct (7) through a concave fitting (17) with a large radius, preferably with a bending radius of between one tenth and five times the diameter of said second duct (7).

13. Reactor according to claim 10, characterized in that said open end (18) comprises a concave section (13) with a large radius, preferably with a bending radius of between one tenth and five times the diameter of said second duct (7).

14. Reactor according to claim 8, characterized in that said first duct (8) comprises, on the inside, a swirling device (12) for giving swirling motion to a fluid that crosses it.